

## WHAT IS CLAIMED IS:

1. A method for measuring the distance of a gap separating an eddy current transducer and a target, said method comprising:

determining a normalized impedance curve for the transducer;

determining a time rate of change of the normalized impedance of the transducer along a line of constant gap; and

correcting an apparent gap magnitude using the determined time rate of change.

2. A method in accordance with Claim 1 wherein determining a normalized impedance curve comprises:

calculating a complex electrical impedance value of the eddy current transducer at a plurality of gap distance values; and

normalizing the complex electrical impedance value.

3. A method in accordance with Claim 1 wherein determining a normalized impedance curve comprises determining a normalized impedance curve in real-time.

4. A method in accordance with Claim 1 wherein determining a time rate of change comprises determining a time rate of change due to a magnetic field of the target.

5. A method in accordance with Claim 1 wherein correcting an apparent gap comprises correcting the apparent gap to facilitate reducing a contribution to the apparent gap by a magnetic field of the target.

6. A method in accordance with Claim 1 wherein a time rate of change of the distance separating the eddy current transducer and the target represents

a vibration of the target, said method further comprising correcting an apparent vibration magnitude using the determined time rate of change.

7. A method in accordance with Claim 6 wherein the target is a rotatable shaft, said method comprising correcting an apparent vibration magnitude of the rotating shaft using the determined time rate of change.

8. A method in accordance with Claim 7 wherein the rotatable shaft is at least partially magnetized and wherein rotating the shaft induces an alternating magnetic field, said method comprises:

sensing the alternating magnetic field using the transducer; and

correcting an apparent vibration magnitude of the rotating shaft due to the alternating magnetic field using the determined time rate of change.

9. A method in accordance with Claim 1 further comprising determining the strength of a magnetic field based on the time rate of change of the transducer normalized impedance along a line of constant gap.

10. A method in accordance with Claim 1 further comprising determining whether the target has been exposed to an external magnetic field.

11. A method in accordance with Claim 1 further comprising determining an orientation of the target in a magnetic field with respect to the eddy current transducer.

12. A method in accordance with Claim 1 further comprising modifying a proximity algorithm to facilitate modifying the transducer output signal due to external magnetic fields.

13. A method for measuring a gap distance separating an eddy current transducer and a target, said method comprising:

calculating a complex electrical impedance value of the eddy current transducer at a plurality of gap distance values;

normalizing the complex electrical impedance value;

determining a time rate of change of the normalized impedance of the transducer along a line of constant gap; and

correcting an apparent gap magnitude using the determined time rate of change to facilitate reducing a contribution to the apparent gap by a magnetic field of the target.

14. A method in accordance with Claim 13 wherein the target is a rotatable shaft and wherein a time rate of change of the gap distance separating the eddy current transducer and the target represents a vibration of the rotatable shaft, said method further comprising correcting an apparent vibration magnitude using the determined time rate of change.

15. An apparatus for determining the distance of a gap between an eddy current transducer and a conductive target material, said apparatus comprising:

an eddy current transducer; and

a processor operatively coupled to said transducer, said processor configured to:

generate a normalized impedance curve for said transducer and said target;

determine a time rate of change of the transducer normalized impedance along a line of constant gap; and

correct an apparent gap magnitude using the determined time rate of change.

16. An apparatus in accordance with Claim 15 further comprising:

a signal generator operatively coupled to said eddy current transducer configured to drive a current through said eddy current transducer;

a sampling circuit configured to sample and digitize an analog voltage impressed across said eddy current transducer; and

a convolver circuit for convolving the digitized voltage with a digital waveform for forming a complex number correlative to the analog voltage impressed across said eddy current transducer wherein said processor is configured to process the complex number into a gap distance value correlative to a gap distance between said eddy current transducer and the conductive target material.

17. An apparatus in accordance with Claim 16 wherein said processor is configured to process the eddy current transducer impedance and a measured frequency of the current driving said eddy current transducer to generate a normalized impedance curve.

18. An apparatus in accordance with Claim 16 wherein said signal generator is configured to adjust the frequency of the current driving said eddy current transducer.

19. An apparatus in accordance with Claim 16 further comprising an output circuit configured to output a signal as a function of the gap distance value which is correlative to said gap distance between said eddy current transducer and said conductive target material.

20. An apparatus in accordance with Claim 19 wherein said output circuit further comprises at least one of a display, a digital signal output, and an analog signal output.

21. A computer program embodied on a computer readable medium for determining the distance of a gap separating a eddy current transducer and a target, said program comprising a code segment that receives complex impedance information and then:

determines a normalized impedance curve for the transducer;

determines a time rate of change of the normalized impedance of the transducer along a line of constant gap; and

corrects an apparent gap magnitude using the determined time rate of change.

22. A computer program in accordance with Claim 21 further comprising a code segment that:

calculating a complex electrical impedance value of the eddy current transducer at a plurality of gap distance values; and

normalizing the complex electrical impedance value.

23. A computer program in accordance with Claim 21 further comprising a code segment that determines a normalized impedance curve in real-time.

24. A computer program in accordance with Claim 21 further comprising a code segment that determines a time rate of change due to a magnetic field of the target.

25. A computer program in accordance with Claim 21 further comprising a code segment that corrects the apparent gap to facilitate reducing a contribution to the apparent gap by a magnetic field of the target.

26. A computer program in accordance with Claim 21 wherein a time rate of change of the gap distance separating the eddy current transducer and the target represents a vibration of the target, said computer program further comprising a code segment that corrects an apparent vibration magnitude using the determined time rate of change.

27. A computer program in accordance with Claim 26 wherein the target is a rotatable shaft, said computer program further comprising a code segment that corrects an apparent vibration magnitude of the rotating shaft using the determined time rate of change.

28. A computer program in accordance with Claim 27 wherein the rotatable shaft is at least partially magnetized and wherein rotating the shaft induces an alternating magnetic field sensed by the transducer, said computer program further comprising a code segment that corrects an apparent vibration magnitude of the rotating shaft due to the alternating magnetic field using the determined time rate of change.

29. A computer program in accordance with Claim 21 further comprising a code segment that determines the strength of the magnetic field based on the time rate of change of the transducer normalized impedance along a line of constant gap.

30. A computer program in accordance with Claim 21 further comprising a code segment that determines whether a target has been exposed to an external magnetic field.

31. A computer program in accordance with Claim 21 further comprising a code segment that determines an orientation of the target in a magnetic field with respect to the eddy current transducer.

32. A computer program in accordance with Claim 21 further comprising a code segment that modifies a proximity algorithm to facilitate modifying the transducer output signal due to external magnetic fields.